CLINICAL CASE

Percutaneous extraction of a ureteral stent after tubeless percutaneous nephrolithotomy


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Abstract

Aims: To evaluate the percutaneous removal of a ureteral stent after percutaneous nephrolithotomy (PNL).
Methods: The study included 7 patients that underwent tubeless PNL, leaving a tether at the proximal end of the ureteral stent with nylon 3-0 suture, exteriorizing it through the access tract. The ureteral stent was percutaneously removed one week after surgery. Follow-up was conducted with a postoperative plain abdominal x-ray, kidney ultrasound, and urine culture.
Results: The patients presented with adequate pain tolerance with a mean of 2 points on the visual analog scale for pain. Two patients had a positive urine culture at the follow-up at 1 month. One patient was readmitted to the emergency department due to fever. None of the patients presented with urinoma in the control ultrasound.
Discussion: The tubeless technique in PNL has reduced the procedure’s morbidity, with a decrease in postoperative pain and a shorter hospital stay. Percutaneous removal of the stent eliminates the need for postoperative cystoscopy.
Conclusions: The percutaneous removal of a ureteral stent after tubeless PNL is simple, feasible, and reproducible and is adequately tolerated as an office procedure.

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Introduction
In 1955 Goodwin et al. described the percutaneous nephrostomy technique for the treatment of hydronephrosis.1 Percutaneous nephrolithotomy (PNL) was first reported on in 1976 by Fernstroem and Johannson, and it has substituted open surgery in the treatment of large kidney stones, with a higher rate of stone clearance.2,3

The PNL complication rate is reported at 23-30% worldwide. The rate of significant blood loss is under 8% and the need for blood transfusion is from 5-18%. The septicemia rate is from 0.9-4.7%, and rate of massive hemorrhage that requires intervention is from 0.6-1.4%. Pleural lesion in relation to percutaneous puncture presents in 2.3-3.1% of cases and colonic lesion in 0.2-0.8% of patients.4

In standard PNL, a nephrostomy catheter is routinely placed at the end of the procedure for the purpose of stopping bleeding, helping renal drainage, preventing urinary extravasation, and providing access in case of the need for another intervention. However, this practice has been associated with postoperative pain and longer hospital stay.5,6

In order to reduce nephrostomy catheter morbidity, modifications have been made, such as eliminating catheter placement at the end of the PNL and leaving only a ureteral stent. This is known as a tubeless PNL and it has been associated with less postoperative pain, lower use of opioid analgesics, faster recovery, and shorter hospital stay, without compromising the efficacy and safety of the procedure.7,8

Despite the fact that tubeless PNL has been shown to be equivalent to standard PNL in terms of specific disease results, and to be superior in terms of patient comfort, it still has the disadvantage of requiring a routine cystoscopy one week after the surgery to remove the ureteral stent.

In 2006, Shpall et al. described a new technique in which the ureteral stent is placed with a tether attached to the J at the renal pelvis that is exteriorized through the access tract, enabling the stent to be removed directly through the flank. This can be done in the physician’s office without the need for cystoscopy.9

Methods
Ten patients that were candidates for PNL at the Hospital General del Estado de Sonora were initially included in the study. Of those 10, 3 were excluded because they needed another procedure in addition to the PNL in the same surgery. At the end of the study, 7 patients remained that underwent tubeless PNL.

Three of the patients in the study were women and 4 were men. Their mean age was 47.4 years. Two patients presented with chronic degenerative disease, 2 patients had a BMI > 30, all the patients presented with kidney stones > 1 cm, and one patient had more than one stone. The preoperative characteristics are shown in table 1.

All the patients received general anesthesia and they were placed in the ventral decubitus position. A single fluoroscopy-guided subcostal entrance tract in the flank was used in all the patients and it was dilated to 30 Fr with Alken metallic dilators.

Lithotripsy employing LithoClast® was performed in all the patients, extracting the fragments with a trident tweezers through the tract.
At the end of the procedure, an anterograde 26 cm by 6Fr COOK® ureteral stent was placed with a tether attached to it at the proximal end with nylon 3-0 suture; the tether was exteriorized through the access tract, fixing it to the skin with an adhesive bandage (fig. 1). The surgical results are shown in table 2.

**Results**

No residual lithiasis was identified in the postoperative plain abdominal film in any of the patients and they were released the day after the surgery with no complications.

**Table 1** Preoperative characteristics

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex</th>
<th>Age (years)</th>
<th>Chronic degenerative diseases</th>
<th>BMI</th>
<th>Stone size</th>
<th>Stone no.</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>W</td>
<td>52</td>
<td>DM, HBP</td>
<td>30</td>
<td>10mm</td>
<td>1</td>
<td>Lower calyx</td>
</tr>
<tr>
<td>2</td>
<td>W</td>
<td>52</td>
<td>-</td>
<td>26</td>
<td>15mm</td>
<td>1</td>
<td>Lower calyx</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>37</td>
<td>HBP</td>
<td>40</td>
<td>10mm</td>
<td>1</td>
<td>UPJ</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>45</td>
<td>-</td>
<td>25</td>
<td>10mm</td>
<td>1</td>
<td>Lower calyx</td>
</tr>
<tr>
<td>5</td>
<td>W</td>
<td>57</td>
<td>-</td>
<td>23</td>
<td>12.6/10mm</td>
<td>2</td>
<td>Pelvis/lower calyx</td>
</tr>
<tr>
<td>6</td>
<td>W</td>
<td>45</td>
<td>-</td>
<td>25</td>
<td>15mm</td>
<td>1</td>
<td>Lower calyx</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>55</td>
<td>-</td>
<td>28</td>
<td>15mm</td>
<td>1</td>
<td>UPJ</td>
</tr>
</tbody>
</table>

BMI: Body mass index; DM: Diabetes Mellitus; HBP: High blood pressure; M: Man; UPJ: Ureteropelvic junction W: Woman

**Figure 1** Ureteral stent placement with a tether for percutaneous extraction. A. Ureteral stent with nylon tether at one of its ends. B. Proximal end of the ureteral stent within the renal pelvis with nylon tether at the proximal end, which is exteriorized through the access tract.

**Table 2** Surgical results

<table>
<thead>
<tr>
<th>Case</th>
<th>Intraoperative bleeding</th>
<th>Surgery duration</th>
<th>Hospital stay</th>
<th>Residual lithiasis in KUB</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>100ml</td>
<td>1h 10min</td>
<td>1 day</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>15ml</td>
<td>40min</td>
<td>1 day</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>20ml</td>
<td>1h 30min</td>
<td>1 day</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>20ml</td>
<td>25min</td>
<td>1 day</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>20ml</td>
<td>25min</td>
<td>1 day</td>
<td>No</td>
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<tr>
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<td>35min</td>
<td>1 day</td>
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</tr>
<tr>
<td>7</td>
<td>10ml</td>
<td>1h</td>
<td>1 day</td>
<td>No</td>
</tr>
</tbody>
</table>

KUB: Kidney, ureter, bladder
Percutaneous stent removal was performed as an office procedure 7 days after the surgery (fig. 2) with adequate tolerance to the intervention that did not require the administration of analgesics or local anesthesia, obtaining a mean score of 2 on the visual analog scale for pain. The men referred to having greater pain, compared with the women. The absence of urinoma was corroborated through kidney ultrasound carried out 14 days after the surgery. Follow-up was conducted for one month, in which only one patient was admitted to the emergency department due to fever one day after percutaneous stent removal, but he did not present with any other complications. Two patients had a positive urine culture at the follow-up of one month (table 3).

### Discussion

Tubeless PNL was initially recommended only in strictly selected patients that met the following criteria: a minimum of bleeding, absence of urothelial perforation or urinary extravasation, absence of residual lithiasis or ureteral obstruction, normal renal anatomy and function, stones < 3 cm, surgery duration < 2 h, subcostal approach, and not more than 2 access tracts.\(^8\)\(^\text{11}\)

The perfecting of the technique has enabled the extended applicability of tubeless PNL. Sofer et al.\(^6\) presented a case series of 66 tubeless PNLs in patients that did not undergo any preoperative selection method and that included patients with solitary and anomalous kidney, patients that had undergone previous surgical procedures, supracostal or multiple tract access, large or complex stones, and prolonged surgery duration. Shah et al. reported case series of 10 bilateral tubeless PNLs with adequate postoperative results.\(^1\)\(^1\)

The problem of the need for postoperative cystoscopy to remove the ureteral stent was resolved through the technique described by Sphall et al.\(^1\)\(^0\) Nevertheless, comparative studies are still required in order to determine the advantages and safety of this technique.

In our study, we removed the ureteral stent through the access tract in the patients’ flanks with adequate pain tolerance to the intervention that did not require the administration of analgesics or local anesthesia, obtaining a mean score of 2 on the visual analog scale for pain. The men referred to having greater pain, compared with the women. The absence of urinoma was corroborated through kidney ultrasound carried out 14 days after the surgery. Follow-up was conducted for one month, in which only one patient was admitted to the emergency department due to fever one day after percutaneous stent removal, but he did not present with any other complications. Two patients had a positive urine culture at the follow-up of one month (table 3).

### Table 3 Results of the percutaneous removal of the ureteral stent

<table>
<thead>
<tr>
<th>Case</th>
<th>VAS pain</th>
<th>Perinephric collections</th>
<th>Complications</th>
<th>Urine culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>No</td>
<td>No</td>
<td>Negative</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>No</td>
<td>No</td>
<td>Negative</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>No</td>
<td>Fever after removal</td>
<td>Positive (Enterobacter cloacae)</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>No</td>
<td>No</td>
<td>Negative</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>No</td>
<td>No</td>
<td>Negative</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>No</td>
<td>No</td>
<td>Positive (Escherichia coli)</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>No</td>
<td>No</td>
<td>Negative</td>
</tr>
</tbody>
</table>

VAS: Visual analog scale
tolerance, no need for analgesics or local anesthesia, and no complications during the removal or the patient follow-up. The only contraindication for percutaneous removal of the ureteral stent was the opening of the urothelium upon performing endopyelotomy during the same surgery.

Conclusions

In our study, ureteral stent removal after a tubeless PNL was feasible, simple, and reproducible. Tolerance was adequate as an office procedure, reducing cost and avoiding the morbidity inherent in a cystoscopy. There were no clinically significant complications with the percutaneous removal of the ureteral stent. Further studies with larger samples, as well as comparative studies, are required in order to establish the efficacy and safety of this procedure.

Financial disclosure

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Conflict of interest

The authors declare that there is no conflict of interest.

References